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METHOD OF PRODUCING NONCAKING FERTILIZER  
[Sposob polucheniya neslezhivayushchegosya udobreniya]

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The invention concerns the production of mineral fertilizers and can be used to eliminate caking of fertilizers.

There is a known method of producing a stabilized fertilizer, for example ammonium nitrate, by coating the particles of the crystalline ammonium nitrate with an acid followed by application of solid inorganic substances—oxides or carbonates of calcium or magnesium [1].

A shortcoming of this method is the fact that hygroscopic salts of calcium or magnesium that strongly attract moisture are formed on the surface of the particles. Uniform distribution of the calcium and magnesium salts on the surface of the granules cannot be achieved.

Closest to the proposed invention in technical nature is a method of producing a solid granulated ammonium nitrate by treating granules of the fertilizer first with nitric acid and then neutralizing them with gaseous or liquid ammonia [2].

A shortcoming of this method is that ammonium nitrate, which is a hygroscopic compound that tends to cake ,additionally forms on the surface . The strength of the granules is 0.85 kg/granule.

The goal of the invention is an improvement of the strength of the granules and of the hygroscopic point, while at the same time enriching the fertilizer with trace elements.

This goal is achieved in that ammonium complexes of copper, zinc, cobalt, or nickel are used as the ammonium compounds. Nitric, sulfuric, phosphoric, oxalic, or succinic acids are used as the acid, and the ammonium complexes are added in the amount of 5-30% of the weight of the fertilizer.

As a result, the strength of the granules increases by a factor of 1.5 and the hygroscopic point rises, and the fertilizer becomes richer in trace elements. Data of a comparative analysis are given in the table.

Example. 2 g nitric acid (concentration 56%), or 1 g sulfuric acid (concentration 98%), or 6 g oxalic acid (concentration 35%), or 0.7 g succinic acid (concentration 30%), or 2 g phosphoric acid (concentration 62%) is sprayed onto 100 g granular urea (or ammonium nitrate) while stirring the

fertilizer, and then the fertilizer is treated for 1-5 min, depending on the stirring intensity and the drying temperature, with 30 g ammonium complex obtained by dissolving 5 g copper sulfate, or 7 g zinc sulfate, or 2.5 g cobalt sulfate, or 2 g nickel sulfate in 30 g 25% ammonia solution. After drying, a granular fertilizer with a coating of ammonium complex is obtained.

Sample	Granular strength, kg/granule	Hygroscopic point, %	Cakeability, %
Proposed			
Ammonium nitrate treated with nitric acid and calcium oxide	0.82	60.1	55.4
Urea treated with sulfuric acid and magnesium carbonate	0.47	72.3	78.3
Ammonium nitrate treated with nitric acid and ammonia	0.85	63.1	65.0
Known			
Urea treated with nitric acid and an ammonium complex of copper	0.62	82.3	97.3
Ammonium nitrate treated with sulfuric acid and an ammonium complex of zinc	1.06	67.8	76.4
Urea treated with oxalic acid and an ammonium complex of cobalt	0.58	81.4	94.2
Ammonium nitrate treated with orthophosphoric acid and an ammonium complex of nickel	1.22	68.1	81.3

### Claims

1. A method of producing a noncaking fertilizer by successive treatment of granules of fertilizer with an acid and ammonium compounds, characterized in that, with the goal of improving the strength of the granules and the hygroscopic point, while simultaneously enriching the fertilizers in trace elements, ammonium complexes of copper, or zinc, or cobalt, or nickel are used as the ammonium compounds.

2. A method as in Claim 1, characterized in that nitric, or sulfuric, or phosphoric, or oxalic, or succinic acid is used as the acid, and the ammonium compounds are added in the amount of 5-30% of the weight of the fertilizer.

Sources of information considered in examiner's evaluation:

1. U.S. Patent No. 3419379, Cl. 71-60, 1968.
2. U.S. Patent No. 3199950, Cl. 23-103, 1964 (prototype).